



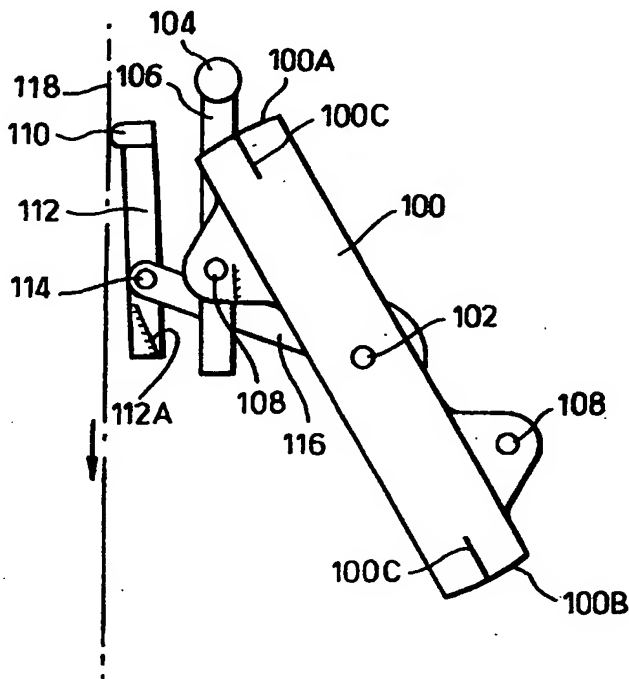
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(54) Title: VERTICAL FORM, FILL AND SEAL MACHINE

(57) Abstract

A vertical form, fill and seal (VFFS) packaging machine comprising a pair of sealing jaws (12; 100; 200, 202; 302, 304) mounted directly or indirectly on parallel shafts (10; 102; 206, 208; 300) for rotation in opposite directions on opposite sides of the path of the packaging material (36; 118; 204; 308) so that the jaws engage the packaging material simultaneously on opposite sides to form successive horizontal seals, and stripping means comprising, in association with the sealing jaw on each side of the path of the packaging material, a pair of stripper carriers (22; 54; 66; 116; 222, 224, 226, 228; 314) mounted for rotation around the corresponding shaft at or near the respective ends thereof, or about an axis parallel to the shaft, a horizontal stripper bar (18B; 40A; 50A; 62; 110; 234; 310) mounted at its respective ends on the two stripper carriers and arranged to be movable with respect to the stripper carriers so that the stripper bar can engage the packaging film along a predetermined vertical stripping path along which, in cooperation with a similar stripper bar associated with the sealing jaw on the other side of the packaging material, it acts to displace downwards any product which might otherwise be trapped in the area of the seal, the stripper carriers being arranged to be rotated faster than the shafts at least while the stripper bars are performing each stripping operation.



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1 VERTICAL FORM, FILL AND SEAL MACHINE
2

3 This invention is concerned particularly with packaging machines
4 commonly referred to as vertical form fill and seal (VFFS) machines. It
5 will be described specifically with reference to such machines, but it
6 should be understood that at least certain aspects of this invention are
7 applicable to machines in which the packaging material moves obliquely
8 downwards or even horizontally while bags are being formed. All such
9 machines are encompassed in this context by the expression "machines
10 of the type described".

11 In a VFFS machine, a web of packaging material is drawn along a
12 former and then passes downwards in tubular formation; the edges are
13 sealed longitudinally as the packaging material moves downwards
14 (assuming, as is preferred, that the packaging material moves
15 continuously), after which horizontal seals are made at regular intervals
16 to form individual bags. A measured quantity of product to be packaged
17 is dropped into each bag before a top seal is formed by sealing jaws
18 which simultaneously form the bottom seal of the next bag. The sealing
19 jaws commonly include a cutting device which separates successive
20 bags.

21 With some materials and in some circumstances, it is desirable to
22 provide a stripping device to ensure that each measured quantity of the
23 product passes downwards reliably into its bag before the top seal is
24 formed. Examples of stripping devices are described in European patent
25 No. 165819 and U.S. patents Nos. 2915866, 3070931, 3256673 and
26 3262244. A further example of a stripping device is described in our
27 patent application WO96/32328. The present invention is concerned
28 particularly with new forms of stripping devices for packaging machines
29 of this general type.

30 According to one aspect of this invention, a packaging machine of
31 the type described, for forming downwardly moving packaging material
32 into bags containing product, comprises a pair of sealing jaws mounted
33 directly or indirectly on parallel shafts for rotation in opposite directions
34 on opposite sides of the path of the packaging material so that the jaws
35 engage the packaging material simultaneously on opposite sides to form
36 successive horizontal seals (or alternate seals if there are, for example,
37 two jaws on each shaft), and stripping means comprising, in association
38 with the sealing jaw on each side of the path of the packaging material, a

1 pair of stripper carriers mounted for rotation around the corresponding
2 shaft at or near the respective ends thereof, or about an axis parallel to
3 the shaft, a horizontal stripper bar mounted at its respective ends on the
4 two stripper carriers and arranged to be movable with respect to the
5 stripper carriers so that the stripper bar can engage the packaging film
6 along a predetermined vertical stripping path along which, in
7 cooperation with a similar stripper bar associated with the sealing jaw on
8 the other side of the packaging material, it acts to displace downwards
9 any product which might otherwise be trapped in the area of the seal,
10 the stripper carriers being arranged to be rotated faster than the shafts at
11 least while the stripper bars are performing each stripping operation.

12 The stripper carriers are preferably driven by a servo motor
13 separate from the motor driving the shafts, which latter motor may also
14 be a servo motor. In this context by "servo motor" we mean a motor of
15 which the output shaft is electronically timed and controlled as to its
16 speed. By this means, the stripper bars can be arranged to be driven
17 faster than the sealing jaws while performing each stripping operation;
18 however, if the number of stripper bars equals the number of sealing
19 jaws, for example, then the average speed of the stripper bars would
20 equal that of the sealing jaws. It should be noted, however, that the
21 sealing jaws may be driven at a cyclically varying speed in order to
22 produce the required bag length which may vary for different products;
23 accordingly, as mentioned above, what is important is that the stripper
24 bars should move faster than the sealing jaws so as to overtake them
25 while performing each stripping operation, whatever the speed of the
26 sealing jaws happens to be.

27 The speed of the jaws, while creating each seal, would normally
28 be equal to the speed of the packaging material which may also be
29 variable as a result of being driven by yet another servo motor.

30 Instead of the stripper bars being driven by an independent servo
31 motor, they may receive their drive from the motor driving the sealing
32 jaws, for example via a gear train or other mechanism whereby the
33 speed of the stripper bars is arranged to fluctuate cyclically, for example
34 sinusoidally or approximately so, with respect to the speed of the jaws.
35 By this means, a stripper bar could overtake the corresponding sealing
36 jaw to perform each stripping operation, and then slow down to allow the
37 jaw to overtake it in preparation for the next stripping operation. This
38 modification, which constitutes an alternative aspect of this invention,

1 may also be applied to belt or chain mounted stripper bars as described
2 in our patent application WO96/32328.

3 Alternatively, a common servo motor may be used to drive the
4 sealing jaws and the strippers if, for example, there are two pairs of
5 sealing jaws with a single stripper (on each side of the packaging
6 material) which is driven at a speed exactly twice that of the sealing jaws.

7 Each stripper bar may be pivotally mounted on its corresponding
8 stripper carriers so that the part of the stripper bar which contacts the
9 packaging material during each stripping operation can move vertically
10 through a predetermined distance, in contact with the packaging
11 material, while overtaking the jaw and performing each stripping
12 operation. One or more springs may be provided to urge the stripper
13 bar into contact with the packaging material with a controlled force.
14 Alternatively, each stripper bar may be controlled as to its angular
15 position with respect to the stripper carriers by means of one or more
16 cams. Another possibility is that each stripper bar may be mounted on
17 its stripper carriers via leaf springs.

18 According to another aspect of this invention, a packaging
19 machine of the type described comprises a pair of cooperating sealing
20 devices mounted directly or indirectly on parallel shafts for rotation in
21 opposite directions on opposite sides of the path of the packaging
22 material so that the sealing devices engage the packaging material
23 simultaneously on opposite sides to form successive horizontal seals,
24 each sealing device comprising two oppositely disposed sealing jaws
25 whereby two seals are formed during each revolution of the shaft; and
26 stripping means comprising a pair of cooperating stripper bars for
27 engaging opposite sides of the packaging material, each stripper bar
28 being carried at its ends by arms which are pivotally or otherwise
29 movably mounted on rotary stripper carrying members lying beyond the
30 ends of the sealing jaws and being driven at an average or set speed
31 twice that of the shaft, whereby the stripping means strips downwards
32 any product lying within the packaging material, in each region about to
33 be sealed, in advance of each pair of sealing jaws engaging the
34 packaging material, the pivotal or other movement of the arms being
35 such as to allow the stripper bars to move past the sealing jaws in order
36 to perform the stripping operations.

37 The shaft is preferably driven by a servo motor capable of varying
38 the shaft speed as may be necessary, for example in order to form bags

1 of different lengths. The stripper carriers may be driven by a separate
2 servo motor at an average speed twice that of the shaft; or alternatively,
3 the stripper carriers may be driven by the servo motor driving the shaft
4 but via a transmission which doubles the speed of the stripper carriers
5 relative to the shaft.

6 The arms carrying each stripper bar may be pivotally mounted on
7 the respective stripper carriers or may alternatively be telescopically
8 mounted so as to slide in a linear bearing or other guide in order to
9 enable the stripper bar to move to different distances from the axis of
10 rotation of the stripper carriers. In either case, the stripper bar is
11 preferably urged outwards by one or more springs, but may alternatively
12 be controlled as to its position by a cam slideway.

13 According to another aspect of this invention a packaging
14 machine of the type described comprises one or more (preferably a pair)
15 of sealing devices arranged to engage opposite sides of the packaging
16 material tube to produce transverse seals at regular intervals, each
17 sealing device being continuously driven for movement along a closed
18 path; and a pair of stripping devices arranged to engage opposite sides
19 of the packaging material tube to strip downwards any product
20 contained within the tube in the area about to be sealed by the sealing
21 devices; each stripping device comprising a stripper bar carried at its
22 ends by arms which are movably mounted on stripper carriers located
23 near the ends of the corresponding sealing device, whereby movement
24 of the arms relative to the stripper carriers causes or allows each bar to
25 move outwards away from the axis of rotation so as to clear and thus be
26 able to move past the corresponding sealing device so as to perform a
27 stripping operation in advance of engagement of the sealing device with
28 the packaging material, the stripper carrier being driven at a rotational
29 speed such as to cause the stripper to have a speed greater than the
30 sealing device at least while passing the sealing device and performing a
31 stripping operation.

32 Examples of different forms of machine according to this invention
33 are shown diagrammatically in the accompanying drawings. In these
34 drawings:

35 Figure 1 is a partly sectioned view of part of one machine;

36 Figures 2 to 4 are diagrammatic representations of three different
37 forms of machine;

38 Figures 5 to 8 are diagrammatic representations of another

1 different form of machine at different stages in its operation;

2 Figure 9 is a plan view of another different machine;

3 Figure 10 is a fragmentary side view of the machine shown in
4 Figure 9;

5 Figures 11 and 12 show details of the machine shown in Figure 9;
6 and

7 Figure 13 is a diagrammatic representation of another different
8 machine.

9 Figure 1 shows in section the parts located at one end of a shaft
10 10 carrying a pair of oppositely disposed sealing jaws 12 of which outer
11 surfaces 12A will cooperate with a similar sealing jaw arrangement on
12 the other side of the downwardly moving packaging material (not shown
13 here, but see Figure 2) to perform horizontal sealing operations on the
14 packaging material. The jaws may also, as is common, include
15 cooperating cutting arrangements for cutting the packaging material
16 horizontally along the mid-region of each seal so as to simultaneously
17 separate the bags.

18 The shaft 10 is mounted at one end in bearings 14 in a side frame
19 16. The other end of the shaft is similarly mounted in another side frame.
20 In the region of that other side frame the mechanism may be virtually an
21 exact mirror image of the arrangement shown in Figure 1.

22 Two oppositely disposed stripper members 18 and 20 are
23 pivotally mounted at each end (only one end being shown in Figure 1)
24 on a stripper carrier 22 which is mounted on a sleeve 24 rotatable
25 around the shaft 10 with the aid of a bearing 26. Each stripper member
26 has an inner end portion 18A, 20A which is parallel to the axis of the
27 shaft 10 and is rotatable in the member 22.

28 As shown in connection with the stripper member 18, the active
29 portion 18B, comprises a bar parallel to the axis of the shaft 10, this
30 portion of the stripper being arranged to engage the packaging material
31 and to perform stripping operations in cooperation with a similar
32 stripping member on the other side of the packaging material. A spring
33 26 for urging the stripping member against the packaging material is
34 shown diagrammatically in Figure 1 in relation to the stripping member
35 18, the same arrangement being provided for the stripping member 20.

36 One end of the sleeve 24 adjacent to the side frame 16 carries a
37 gear 24A which meshes with a gear 28 fixed to a shaft 30 which is
38 parallel to the shaft 10 and is rotatable in a bearing 32 in the side frame

1 16. At its outer end the shaft 30 carries a pulley 32 which is driven by a
2 timing belt 34 passing also around a pulley on a drive shaft (not shown)
3 which extends across the machine (parallel to the shaft 10) so as to drive
4 the stripper carrier at the other end of the shaft 10 in the same way. As
5 will be understood, the shaft driving the belt 34 is preferably, as
6 mentioned above, driven by a servo motor separate from the motor
7 (preferably also a servo motor) driving the shaft 10.

8 In place of the belt 34 and pulley 32 it is possible to use a chain
9 and sprocket arrangement.

10 Figure 2 shows diagrammatically an arrangement similar to Figure
11 1, viewed in the direction of the axis of the shaft 10. It shows the
12 apparatus at the stage of forming a horizontal seal across packaging
13 material 36 to complete one bag 38 while forming the bottom sealed
14 edge of the next bag. The jaws 12 at this stage extend horizontally, and
15 it will be understood that there is a similar piece of apparatus on the
16 other side of the packaging material 36. Thus the jaws, which are
17 heated, cooperate to form each horizontal seal.

18 Figure 2 shows only one stripping member 40 which is pivoted at
19 42 to the radially extending stripper carrier 22. The spring 26 is shown
20 anchored at one end to the stripper carrier 22 and at the other end to the
21 stripping member so as to urge the stripping member in a clockwise
22 direction about the pivot 42. Thus the horizontal bar portion of the
23 stripping member (corresponding to the part 18B in Figure 1) is pressed
24 against the packaging material. It will be understood that, shortly before
25 the stage shown in Figure 2, the stripping member lagged behind the
26 jaw 12, and that its greater speed resulted in it overtaking the jaw 12
27 while performing a stripping operation in cooperation with a similar
28 stripping member on the other side of the packaging material.

29 When the stripping member is away from the packaging material,
30 it is free to rotate about the pivot 42, relative to the stripper carrier 22, to
31 the position shown in chain dotted outline 40¹ under the influence of the
32 spring 26.

33 As shown also in Figure 2, each sealing jaw may carry a pivoted
34 clamp 42 (only one of which is shown complete, albeit diagrammatically)
35 pivotally mounted at 44 on the jaw. A spring 46 acting between the jaw
36 and the clamp normally, while the clamp is remote from the packaging
37 material, holds the clamp against a stop 48. When the outer end of the
38 clamp (which also comprises a horizontal bar extending right across the

1 packaging material similarly to the stripper member) engages the
2 packaging material and cooperates with a similar clamp on the other side
3 of the packaging material, it swings against the action of the spring to
4 approximately the position shown in chain dotted outline 42A.

5 The purpose of the clamps is to prevent product from dropping
6 into the region of the seal just as the seal is about to be formed.

7 Figure 2 shows, for convenience, only one stripper member. In
8 practice there may be two diametrically opposite to one another for
9 cooperating with the respective jaws 12, as shown in Figure 1.
10 Preferably, however, the arrangement operates with only one stripper
11 driven about the axis of the shaft 10 at twice the speed (or an average of
12 twice) of the shaft 10. Another possibility is that there could be, for
13 example, three strippers spaced apart by 120° about the axis of the shaft
14 10; in that case the member 24 carrying the strippers would rotate at an
15 average speed equal to two thirds that of the shaft 10, though again the
16 strippers would need to move faster than the jaws while performing each
17 stripping operation. Other possibilities are, for example, that there could
18 be three or four equally spaced sealing jaws on each shaft, with a similar
19 or smaller number of strippers.

20 It will be understood that the speed and timing with which the
21 stripper members approach the packaging material should be such that
22 their horizontal bar portions reach the packaging material (above the
23 region of the forthcoming seal) and move along it, past the clamp and
24 jaw, before both the clamp and the jaw reach the packaging material.
25 With that objective, the outmost positions of the clamps (set by the stop
26 48 in the example shown in Figure 2) need to be determined
27 accordingly.

28 The stripping and clamping bars are parallel to the shaft axes, as
29 described above, and are preferably straight. Alternatively, either or both
30 may be slightly outwardly bowed so as to ensure adequate contact
31 pressure against the packaging material in their middle regions.

32 The clamps, by virtue of their geometry (including their pivot
33 positions), may move upwards relative to the packaging material when
34 they first contact the packaging material and thus perform a slight
35 upward stripping action.

36 Figures 3 and 4 show further alternatives. Figure 3 shows an
37 arrangement in which the or each stripper member 50 is pivotally
38 mounted at 52 to a carrier 54 on a member 56 rotating with respect to

1 the shaft 10. However, instead of the horizontal bar portion 50A of the
2 stripper member being urged towards the packaging material by a
3 spring, in this example it is controlled by a cam. Specifically, in the
4 example shown, the inner end of the stripper member carries a roller 58
5 which runs in a groove-like cam track 60 which may be formed in or
6 mounted on the side frame 16 shown in Figure 1. As before, a similar
7 arrangement exists at the other end of the shaft 10.

8 Figure 4 shows an alternative arrangement in which the or each
9 stripper member 62 is mounted at its opposite ends via leaf springs 64
10 and screws 65 so as to be resiliently movable relative to a stripper carrier
11 66; each leaf spring may be straight when in the unstressed state, and
12 flexes (as shown) while urging the stripper member against the
13 packaging material. Also, in this example, each jaw carries a clamp 68
14 which is similarly mounted at its opposite ends via leaf springs 70; the
15 inner end of each leaf spring is secured by one or more screws 72 to a
16 projection 74 on the corresponding jaw.

17 With each of the above-described arrangements, the stripper drive
18 is preferably independent of that for the sealing jaw or jaws. Moreover,
19 each arrangement may be so constructed that the drive to the strippers
20 can be stopped in the event of a product being packed which does not
21 call for stripping. If, as mentioned above, the stripper drive is derived
22 from the motor driving the jaws, the drive to the stripper or strippers can
23 also be stopped by means of a clutch when necessary.

24 The arrangements described above are based on sealing jaws
25 moving with a purely rotary motion. Alternatively, each sealing jaw may
26 be mounted on the shaft 10 via an arrangement which allows or causes
27 the jaw to remain in a fixed orientation at least while it is engaging the
28 packaging material, which condition may occur along a predetermined
29 distance, rather than instantaneously as in the case of a purely rotary
30 sealing jaw. Such sealing jaws are commonly referred to as D-motion
31 jaws because the locus of each jaw is D-shaped.

32 Figures 5 to 8 show diagrammatically different stages in the
33 rotation of a different form of machine according to this invention.

34 The machine comprises a sealing device 100 which includes
35 oppositely disposed sealing jaws 100A and 100B and is rotatable about
36 an axis 102. Associated with each of the sealing jaws is a horizontal
37 product clamping roller or bar 104, only one of which is shown. The
38 clamping roller is parallel to the axis 102 and extends beyond both ends

1 of the sealing device 100, being carried at its respective ends by two
2 arms 106 pivotally mounted on the sealing device by pins 108.

3 A stripper bar 110 is likewise carried at its respective ends by
4 arms 112 which are pivoted by pins 114 to respective stripper carriers
5 which are shown diagrammatically as arms 116. The arms 116 rotate
6 about the axis 102 at twice the speed of the sealing device 100.

7 Figures 5 to 9 show the sealing and stripping arrangement on one
8 side of a downwardly moving flattened tube of packaging material 118. It
9 will be understood that a similar sealing and stripping arrangement is
10 provided on the left-hand side of the packaging material 118, so that the
11 stripper bars and clamping rollers on opposite sides of the packaging
12 material co-operate with one another to perform the required stripping
13 and clamping functions, and likewise the sealing jaws on opposite sides
14 of the packaging material co-operate to produce horizontal seals at
15 regular intervals along the packaging material. The sealing jaws also
16 include cutting means 100C for cutting the packaging film horizontally so
17 as to separate the successively formed filled bags.

18 It will be understood that the stripper bar and the clamping roller
19 are urged towards the packaging material by suitable springs (not
20 shown).

21 Figure 5 shows the arrangement at a stage shortly after the
22 stripper bar 110 has begun to move along the packaging material so as
23 to strip downwards any product contained within the packaging material
24 in that area. Shortly before this stage, the stripper bar, while in a further
25 extended position under the urging of the spring or springs, (with a stop
26 112A engaging the arm 116) was able to pass the clamping roller 104
27 (shown in its limiting outward position) and also the sealing jaw 100A
28 which is about to make a seal.

29 Figure 6 shows the arrangement after 20° of further rotation of the
30 sealing member 100 and 40° of further rotation of the stripper. At this
31 stage, the clamping rollers 104 on opposite sides of the packaging
32 material begin to cooperate to prevent any product falling downwards
33 past them and into the region about to be sealed.

34 Figure 7 shows the positions after 10° of further rotation of the
35 sealing device and 20° of the stripper. Beyond this stage, there is no
36 need for the stripper bars to engage the packaging material, and it is
37 indeed undesirable for them to do so as they might damage the product
38 in the just-formed bag. Each is accordingly guided away from the

1 packaging material by a stationary cam 120. The arrangement is shown
2 diagrammatically, and in practice each arm 112 would carry a follower
3 roller or wheel arranged to run along the corresponding cam. A
4 continuation of the cam may be provided to control the return of the
5 stripper to its outermost position in preparation for its next stripping
6 operation in association, this time, with the sealing jaw 100B.

7 Figure 8 shows the arrangement at the completion of sealing,
8 namely after 20° of further rotation of the sealing device and 40° of the
9 stripper.

10 In the arrangement shown in Figures 5 to 8, the strippers may be
11 driven at a set speed twice that of the sealing device, but are preferably
12 driven by a servo motor so as to be capable of varying in speed, the
13 average speed still being twice that of the sealing device.

14 The speed at which the packaging material 118 is driven
15 downwards during bag formation is not necessarily constant. It may be
16 varied cyclically as a result of being driven by a separate servo motor in
17 order to optimise the machine operation. For example, the packaging
18 material may be of a type which needs to be slowed down during sealing
19 in order to achieve an adequate jaw contact (sealing) time, different
20 packaging materials requiring different sealing times; moreover, the
21 speed pattern between successive sealing operations needs to take into
22 account the required bag length. At the stage shown by Figure 7, the
23 velocity of the packaging material may be increased so as to be greater
24 than the downward velocity of the clamping rollers 104. This may be
25 achieved by modulating the speed of the servo motor driving the web
26 and/or by modulating the speed of the servo motor driving the sealing
27 device.

28 Figures 9 to 12 show an arrangement which is similar in principle
29 to that shown in Figures 5 to 8.

30 Figure 9 is a partly sectioned plan view and shows the two sealing
31 devices 200 and 202 lying on opposite sides of a flattened tube of
32 packaging material 204. The sealing devices are mounted respectively
33 on shafts 206 and 208 carried by side frame members 210 and 212. A
34 servo motor (not shown) drives the shafts in opposite directions and at
35 equal speeds. For this purpose a double-sided timing belt (not shown)
36 connects a pulley 214 on the shaft 206 with a similar pulley (not shown)
37 on a shaft driven by the servo motor and with a pulley 216 (half the
38 diameter of the other pulleys) on a further shaft 218. A gear 220 on the

1 shaft 206 meshes with a similar gear 221 on the shaft 208.

2 Carrier members for the stripper bars are in the form of gears 222
3 and 224 for one stripper bar, and gears 226 and 228 for the other
4 stripper bar. These gears are all identical; gears 222 and 226 mesh with
5 one another, and likewise gears 224 and 228. Each of these gears is
6 rotatably mounted by means of a bearing around one end of one of the
7 shafts 206, 208. A gear 230 on the shaft 218 (of the same diameter as
8 the gears 222, 226 etc) meshes with the stripper-carrying gear 222, and a
9 similar gear (not shown) on the shaft 218 meshes with the gear 224 so
10 as to drive the stripper-carrying gears at twice the speed of the shafts
11 206 and 208.

12 Figure 10 shows some detail associated with one of the
13 stripper-carrying gears 222. It shows one of the stripper-carrying arms
14 232 which supports and drives one end of a stripper bar 234. The arm
15 232 is pivoted to the gear 222 on a pin 236 and is urged in an
16 anti-clockwise direction about the pin 236 by a spring 238 which pulls
17 the adjacent part of the arm 232 against a stop 240. Opposite ends of
18 the spring 238 are anchored respectively to a pin 242 on the gear 230
19 and to a screw 244 on the arm 232.

20 It will be understood therefore that Figure 10 shows the stripper
21 bar 234 in its outermost position. At this radius from the axis of rotation
22 246 of the gear, it can pass the corresponding sealing jaws and
23 clamping rollers prior to performing a stripping operation in co-operation
24 with a similar stripping bar (not shown) carried by the gear 226. On
25 engaging the packaging material 204, each stripper rotates about its
26 pivot 236, against the action of the spring 238, as will be understood by
27 reference to the example shown in Figures 5 to 8.

28 It is necessary to ensure alignment of the cooperating stripper
29 bars as they move downwards along the packaging material. For that
30 purpose, each stripper bar carries, at each end, a fixed gear segment
31 248 (see Figure 11) which meshes with a similar gear segment on the
32 opposing stripper bar.

33 At each end of each of the shafts 206, 208 (Figure 9) there is a
34 clamping roller carrying arrangement comprising a member 250 which is
35 clamped to the shaft and which carries two pivoted arms 252 (see Figure
36 12) supporting the ends of the clamping rollers 254. The clamping
37 rollers may in fact comprise rods each of which is surrounded by a
38 rotatable sleeve serving as a roller for engaging the packaging material

1 in a rolling manner.

2 Figure 12 shows the arrangement of one of the members 250 with
3 the associated pivoted arms 252. The member 250 has a slot 256 which
4 is closed by a clamping screw 258 to clamp the member 250 on the
5 shaft 208 (in this example). Each arm 252 is pivoted to the member 250
6 by a pin 260 and has an eye 262 at one end (opposite to the clamping
7 rod 254) for engagement by one end of a tension spring 263 of which
8 the other end is secured to a screw 264.

9 At the end which supports the clamping roller, each arm 252
10 carries a fixed gear segment 266 for engaging a corresponding gear
11 segment on the opposed clamping roller arrangement to ensure
12 registration, as in the case of the stripper bars.

13 The phase relationship of the clamping rollers with respect to the
14 sealing jaws can be adjusted slightly by undoing the clamping screws
15 258, rotating the members 250 about the shafts, and then tightening the
16 screws 258. Also, and more importantly, the phase relationship of the
17 stripper bars with respect to the sealing jaws can be adjusted within the
18 drive transmission to the stripper carrier gears. Alternatively, it will be
19 understood that the stripper carrier gears may be driven by a separate
20 servo motor; this would enable the speed pattern (including the
21 rotational phase) of the strippers to be varied independently of the
22 sealing jaws, though the average speed of the strippers would still be
23 twice that of the shafts carrying the sealing jaws.

24 Figure 13 shows diagrammatically another different form of
25 machine according to this invention. A shaft 300 carries two sealing jaws
26 302 and 304 spaced apart by 180°, each carrying a pivotally mounted
27 clamping roller 306 and including cutting means 307. A mirror-image
28 arrangement (not shown) lies on the opposite side of a vertically moving
29 flattened tube of packaging material 308.

30 A single stripper bar 310 is mounted at its ends on two rods 312
31 which are telescopically (slidably) carried by stripper carriers 314 which
32 are rotatable about the axis of the shaft 300 and are driven at twice the
33 speed of the shaft 300 or at an average of twice the speed if the stripper
34 carriers are driven by an independent servo motor. A spring 316 urges
35 the stripper bar outwards, its limiting outward position (as shown) being
36 determined by stops 318 on the rods 312.

37 Figure 13 shows the arrangement as the stripper bar 310 is about
38 to contact the packaging material and then perform a stripping operation

1 (in cooperation with the stripper bar on the other side of the packaging
2 material) while passing the clamping roller and the sealer. The clamping
3 rollers will reach the packaging material shortly after the area which they
4 contact has been stripped by the stripper bars, which area is thus
5 ensured to be product free.

6 As in the previous two examples, the stripper bars may, shortly
7 after passing the sealers, be displaced from the packaging material by
8 stationary cams.

9 As an alternative to the gear segments 248 for maintaining
10 registration of the stripper bars, the following arrangement may be
11 provided: recessed portions of the stripper bars, at or near the ends of
12 the bars, are arranged to engage and slide along two vertical rods. That
13 is to say, the cooperating stripper bars, in the regions of their ends, slide
14 along opposite sides of the two rods which thus ensure that the stripper
15 bars remain in register with one another while performing each stripping
16 operation. A similar provision may be made for the clamping members.
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Claims

1. A packaging machine of the type described, for forming downwardly moving packaging material into bags containing product, comprising a pair of sealing jaws (12; 100; 200,202; 302,304) mounted directly or indirectly on parallel shafts (10; 102; 206,208; 300) for rotation in opposite directions on opposite sides of the path of the packaging material (36; 118; 204; 308) so that the jaws engage the packaging material simultaneously on opposite sides to form successive horizontal seals, and stripping means comprising, in association with the sealing jaw on each side of the path of the packaging material, a pair of stripper carriers (22; 54; 66; 116; 222,224,226,228; 314) mounted for rotation around the corresponding shaft at or near the respective ends thereof, or about an axis parallel to the shaft, a horizontal stripper bar (18B; 40A; 50A; 62; 110; 234; 310) mounted at its respective ends on the two stripper carriers and arranged to be movable with respect to the stripper carriers so that the stripper bar can engage the packaging film along a predetermined vertical stripping path along which, in cooperation with a similar stripper bar associated with the sealing jaw on the other side of the packaging material, it acts to displace downwards any product which might otherwise be trapped in the area of the seal, the stripper carriers being arranged to be rotated faster than the shafts at least while the stripper bars are performing each stripping operation.

2. A machine according to claim 1, in which the movable mounting of each stripper bar on its respective carriers causes or enables the stripper bar to move outwards from its axis of rotation and thus, owing to its greater speed, to overtake the corresponding sealing jaw as it approaches the packaging material in preparation for performing a stripping operation.

3. A machine according to claim 2, in which each sealing jaw carries behind it a movably mounted clamping member (42; 68; 104; 254) arranged, in cooperation with an opposed clamping member on the other side of the packaging material, to prevent product from falling past it and into the area which is about to be sealed or has just been sealed by the cooperating opposed sealing jaws, and in which each stripper bar is arranged by virtue of its speed and position to pass the corresponding

1 clamping member and to engage the packaging material to commence a
2 stripping operation before the clamping member reaches the packaging
3 material, thereby stripping also the area about to be engaged by the
4 clamping member.

5
6 4. A machine according to any one of claims 1 to 3, in which
7 each shaft carries two sealing jaws 180 degrees apart from one another,
8 and the stripper carriers on each side of the packaging material carry
9 just one stripper bar and are driven at a speed or average speed twice
10 that of the shafts.

11
12 5. A machine according to any one of claims 1 to 4, in which
13 the shafts are driven by a servo motor and the stripper carriers are driven
14 by a separate servo motor.

15
16 6. A machine according to claim 5, in which the servo motor
17 driving the stripper carriers is controllable as to its speed and/or phase,
18 whereby the stripping operation with respect to its speed and/or timing
19 can be adjusted while the machine is running.

20
21 7. A machine according to any one of claims 1 to 6, in which
22 each stripper bar is mounted at its ends on arms which are pivotally or
23 slidably mounted on the corresponding stripper carriers.

24
25 8. A packaging machine of the type described, comprising a
26 pair of cooperating sealing devices (100; 200,202; 302,304) mounted
27 directly or indirectly on parallel shafts (10; 102; 206,208; 300) for rotation
28 in opposite directions on opposite sides of the path of the packaging
29 material (36; 118; 204; 308) so that the sealing devices engage the
30 packaging material simultaneously on opposite sides to form successive
31 horizontal seals, each sealing device comprising two oppositely
32 disposed sealing jaws (100A, 100B for example) whereby two seals are
33 formed during each revolution of the shafts; and stripping means
34 comprising a pair of cooperating stripper bars (40A; 50A; 62; 110; 234;
35 310) for engaging opposite sides of the packaging material, each
36 stripper bar being carried at its ends by arms which are pivotally or
37 otherwise movably mounted on rotary stripper carrying members (22;
38 54; 66; 116; 222; 314) lying beyond the ends of the sealing jaws and

1 being driven at an average or set speed twice that of the shaft, whereby
2 the stripping means strips downwards any product lying within the
3 packaging material, in each region about to be sealed, in advance of
4 each pair of sealing jaws engaging the packaging material, the pivotal or
5 other movement of the arms being such as to allow the stripper bars to
6 move past the sealing jaws in order to perform the stripping operations.

7
8 9. A machine according to claim 8, in which each sealing jaw
9 carries behind it a movably mounted clamping member (42; 68; 104;
10 254) arranged to engage the packaging material above the sealing jaw,
11 the corresponding stripper bar being arranged to overtake the clamping
12 member before performing each stripping operation.

13
14 10. A packaging machine of the type described, comprising
15 one or more of sealing devices (12; 100; 200,202) arranged to engage
16 opposite sides of the packaging material (36; 118; 204) to produce
17 transverse seals at regular intervals, each sealing device being
18 continuously driven for movement along a closed path; and a pair of
19 stripping devices arranged to engage opposite sides of the packaging
20 material to strip downwards any product contained within the packaging
21 material in the area about to be sealed by the sealing devices; each
22 stripping device comprising a stripper bar (18B; 40A; 50A; 62; 110; 234)
23 carried at its ends by arms (40; 50; 64; 112; 232) which are movably
24 mounted on stripper carriers (22; 54; 66; 116; 222,224,226,228) located
25 to the sides and separately from the corresponding sealing device,
26 whereby movement of the arms relative to the stripper carriers causes or
27 allows each bar to move away from the axis of rotation so as to clear and
28 thus be able to move past the corresponding sealing device so as to
29 perform a stripping operation in advance of engagement of the sealing
30 device with the packaging material, the stripper carriers being driven at a
31 rotational speed such as to cause the stripper to have a speed greater
32 than the sealing device at least while passing the sealing device and
33 performing a stripping operation.

34
35 11. A packaging machine of the type described, comprising
36 two cooperating sealing devices each comprising at least one sealing
37 jaw (100A, 100B for example) driven by a shaft (for example 102) so as
38 to move continuously along a closed path, and each sealing device

1 having an associated stripping means comprising at least one stripper
2 bar (for example 110) pivotally or otherwise movably mounted at its ends
3 on two rotating carrier members (116) arranged to be driven
4 continuously at a speed which is greater than that of the shaft at least
5 while performing each stripping operation, the movable mounting of the
6 stripper bar on the corresponding carrier members allowing or causing
7 the stripper bar to move along a closed path extending around the path
8 of the sealing jaw or jaws and having a straight portion extending along
9 the packaging material to perform successive stripping operations in
10 cooperation with a similarly movable stripper bar on the other side of the
11 packaging material.

12
13 12. A machine according to claim 11, in which each sealing
14 device comprises two oppositely disposed sealing jaws (100A and 100B
15 for example) and in which the stripping means associated with each
16 sealing means comprises a single stripper bar (110) which is driven by
17 the carrier members (116) at a set or average speed twice that of the
18 shaft (102) of the associated sealing means.

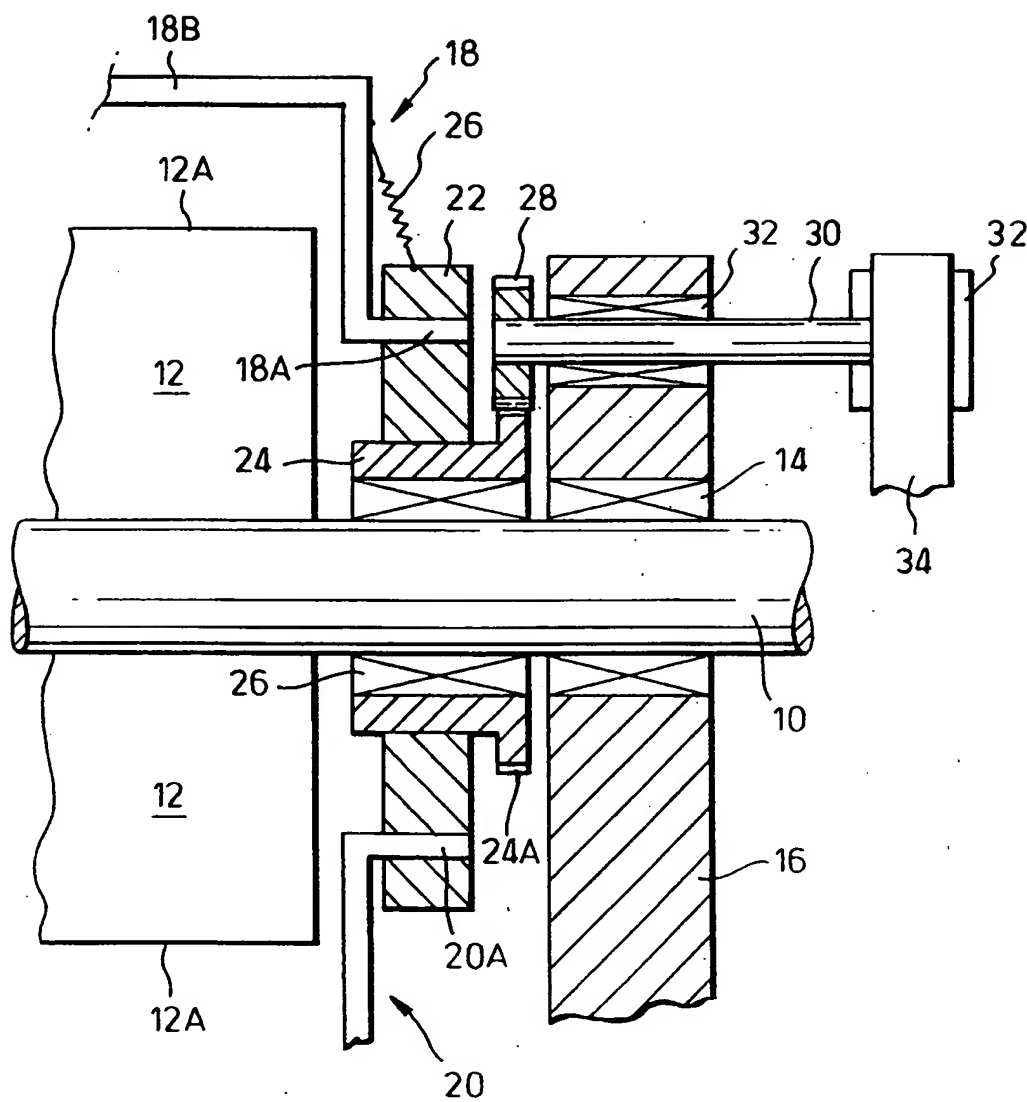
19
20 13. A machine according to claim 12, including means (238) for
21 resiliently urging the stripper bar away from the axis of rotation of the
22 corresponding carrier members, whereby the stripper bar lies at a large
23 enough radius to be able to overtake each sealing jaw in preparation for
24 performing a stripping operation.

25
26 14. A machine according to claim 13, including means (120) for
27 guiding the stripper bar away from the packaging material after the
28 completion of each stripping operation.

29
30 15. A machine according to any one of claims 11 to 14, in
31 which the carrier members (116) for each stripper bar (110) are mounted
32 on end portions of the shaft of the corresponding sealing device for
33 rotation relative to the shaft.

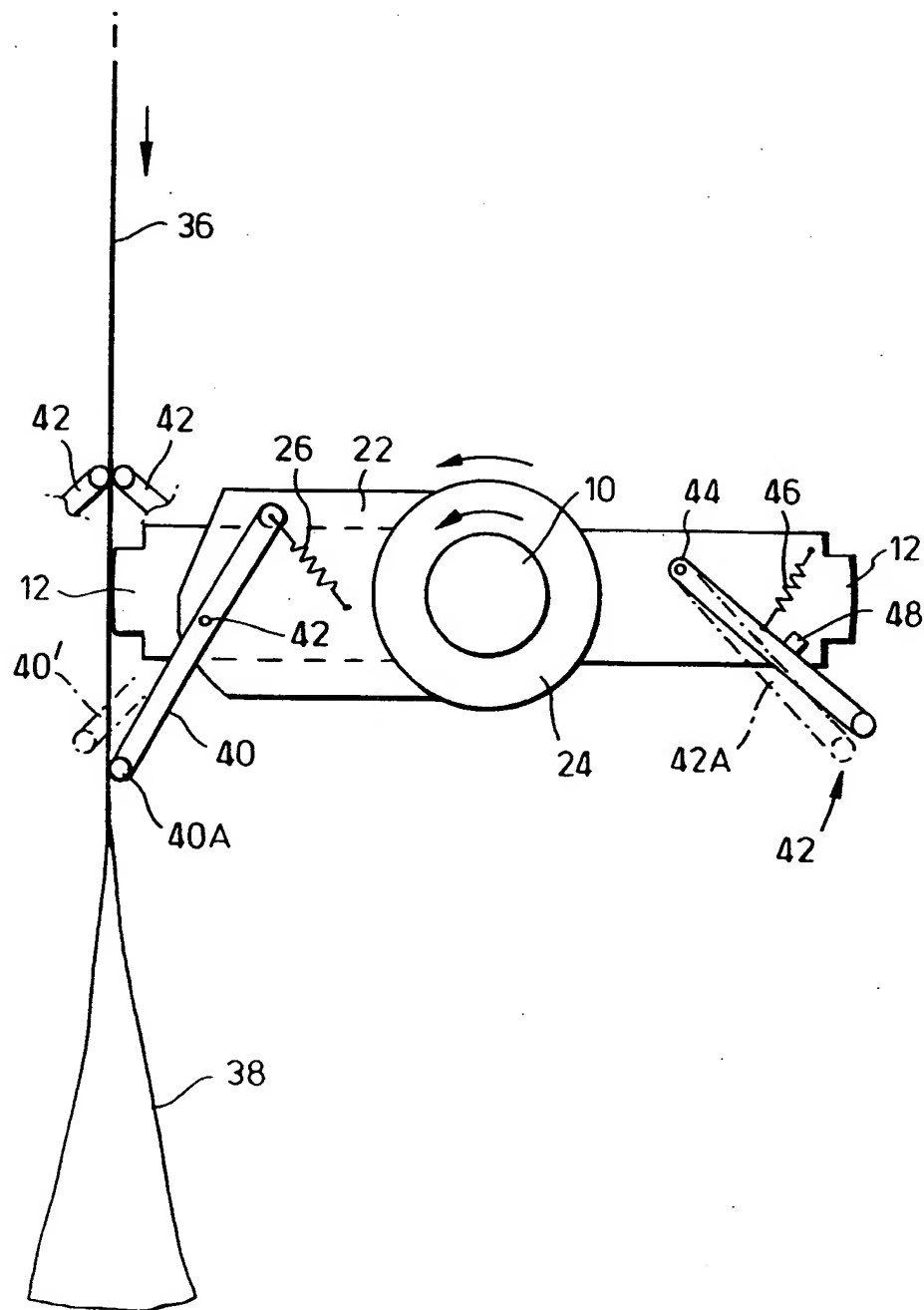
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Fig.1.



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Fig.2.



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Fig.3.

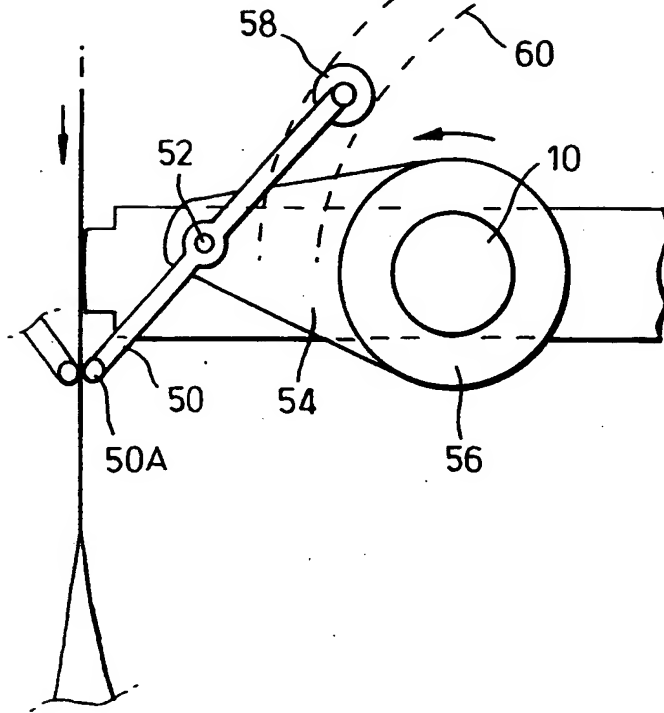
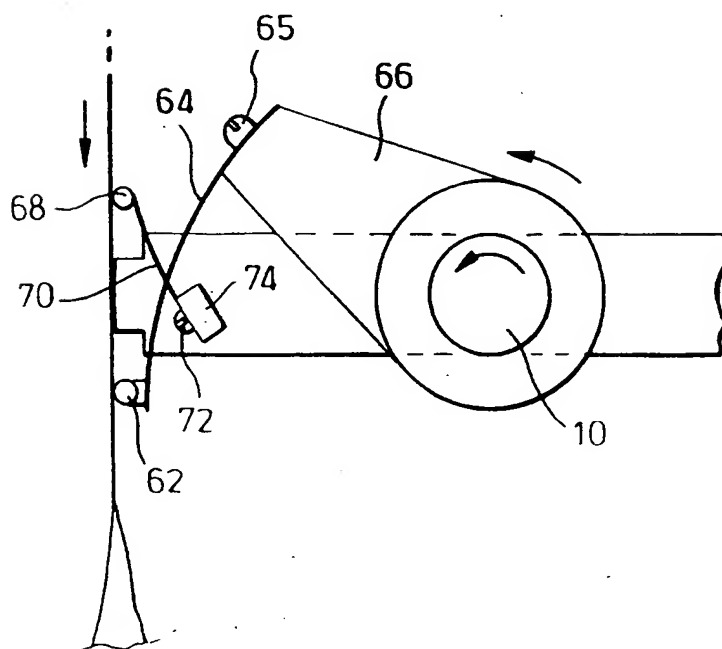


Fig.4.



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Fig.5.

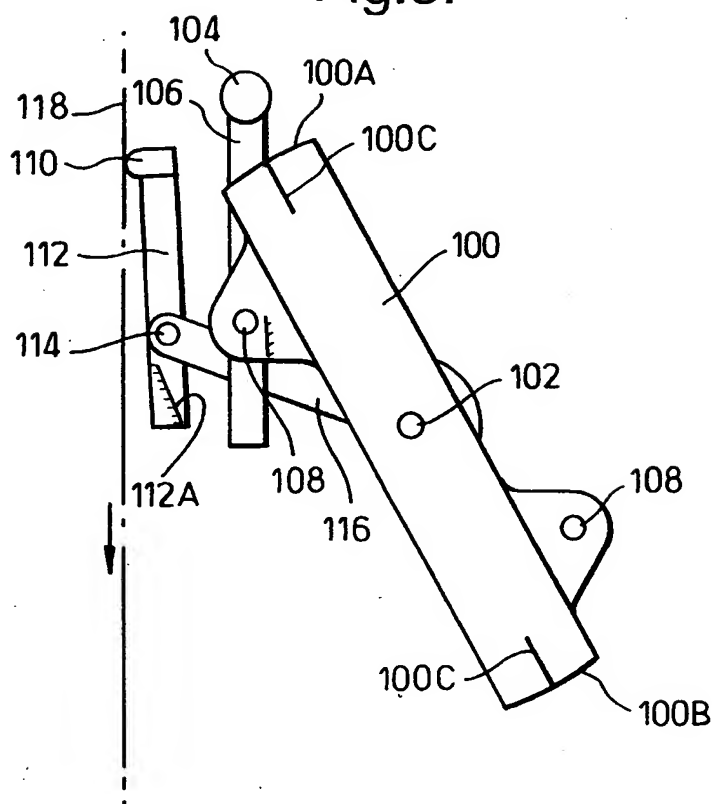
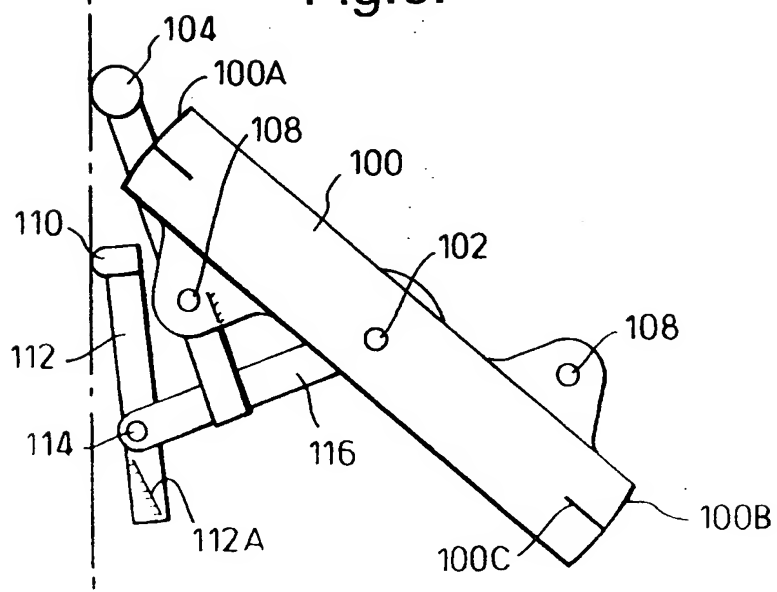


Fig.6.



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Fig.7.

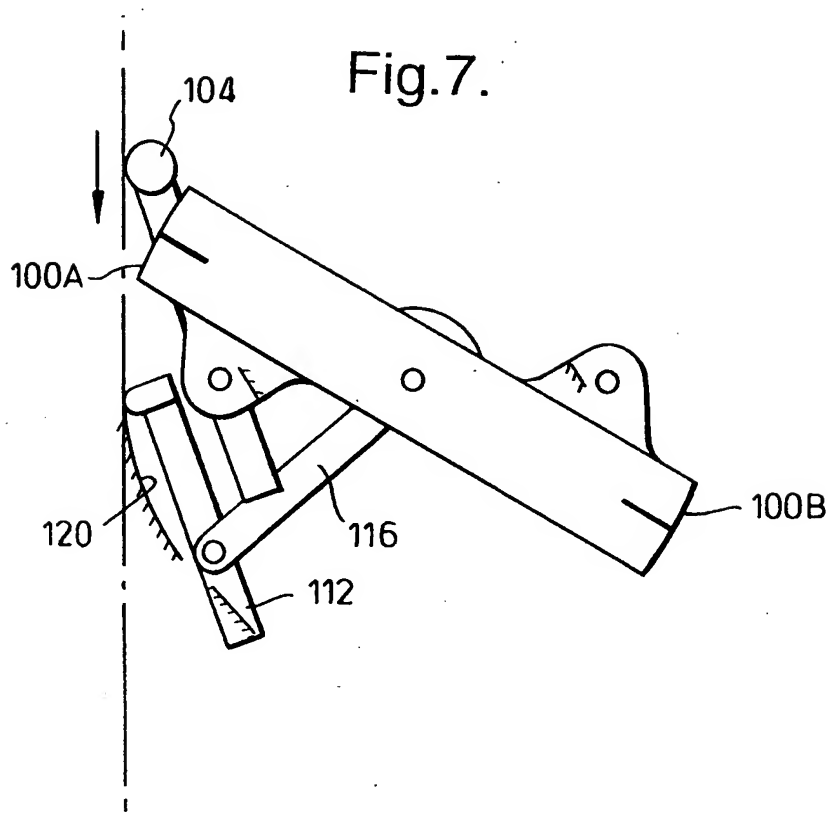
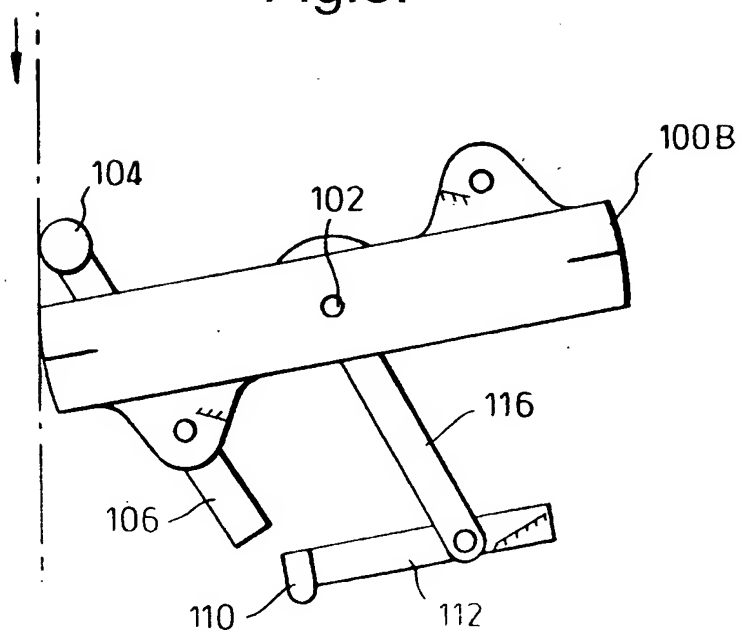
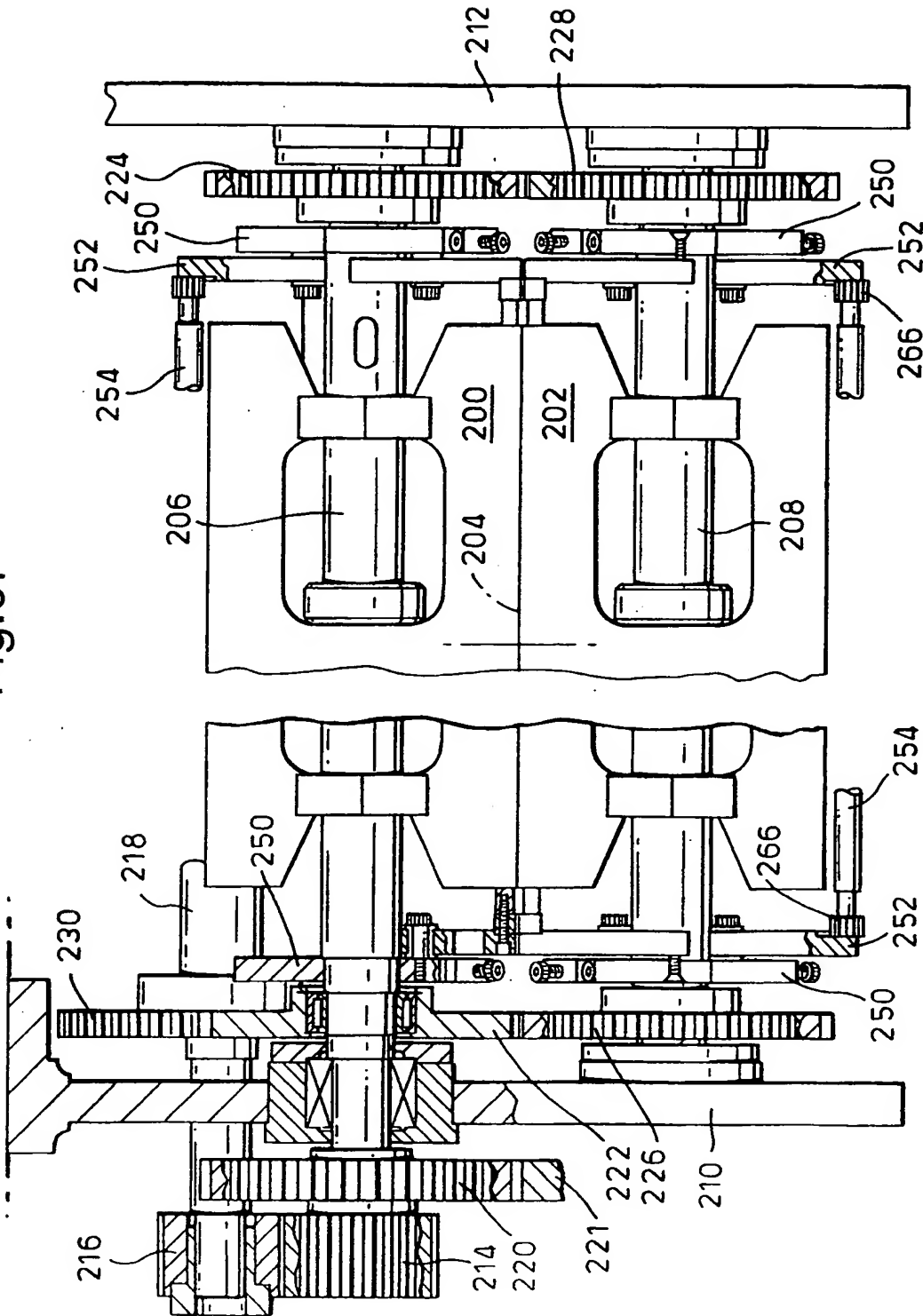


Fig.8.



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Fig.9.



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Fig.10.

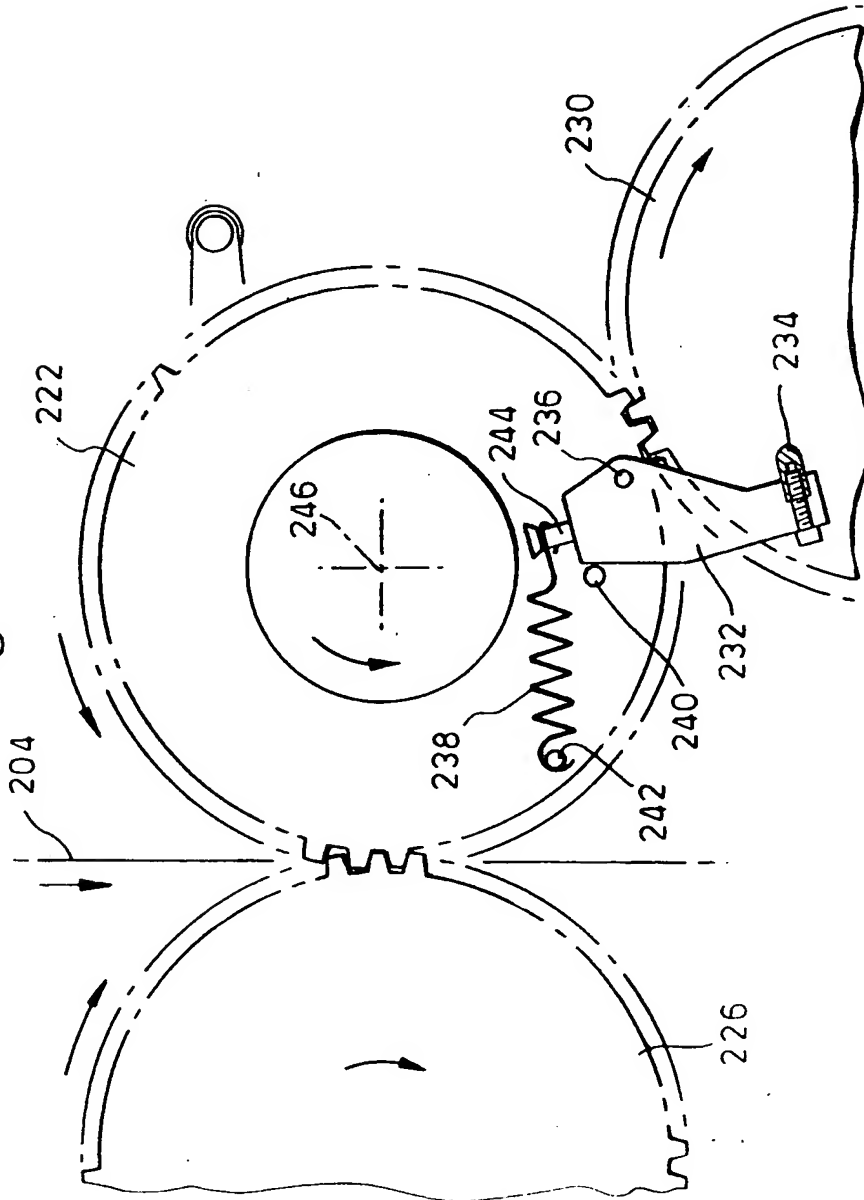
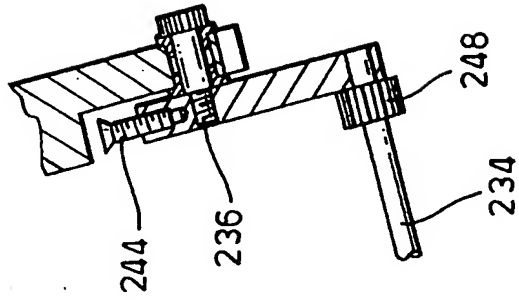


Fig.11.



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Fig.12.

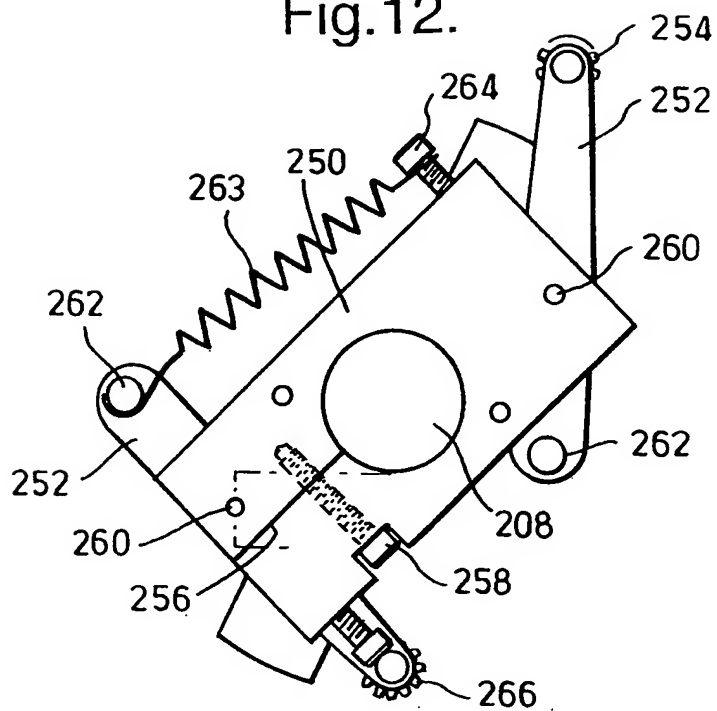
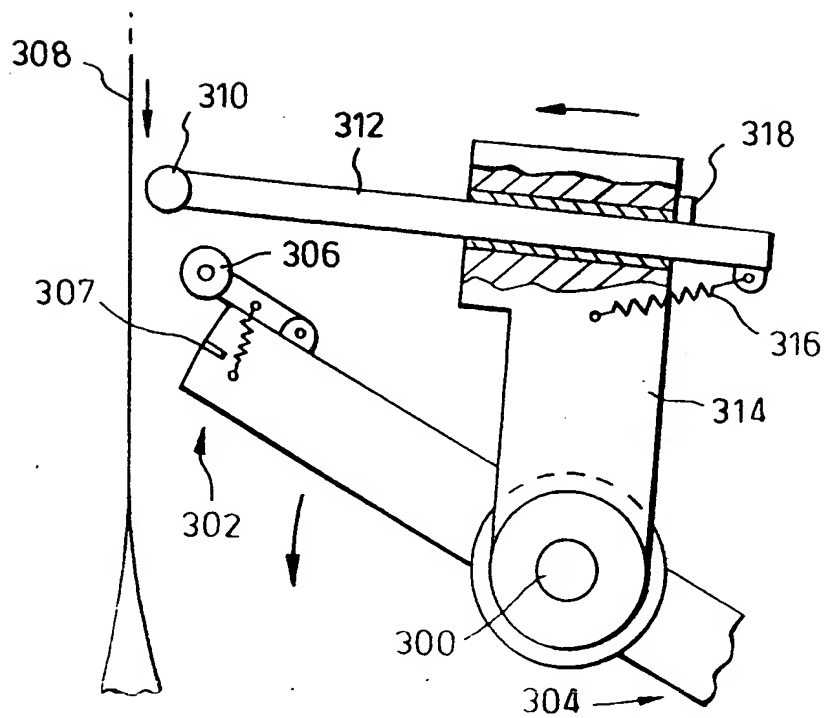


Fig.13.



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/00882

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B65B51/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 666 215 A (A.A. TAYLOR) 9 August 1995 see column 3, line 6 - column 4; figures 2,3	1-3,7-11
A	EP 0 308 861 A (ROVEMA) 29 March 1989 see column 4, line 28-53; figures 1-5	1,2,4,7, 8,10-13
A	WO 96 32328 A (MOLINS) 17 October 1996 cited in the application see page 6, line 34 - page 7, line 29; figure 1	1,5,6,8, 10,11

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

11 June 1998

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/00882

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